

NEW EMPIRICAL RESULTS OF SOME PROCESSES HIGHLIGHTED IN THE DEVELOPMENT OF LEXICAL ABILITIES IN 8 TO 11-12 YEAR OLDS

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ABSTRACT

We have verified the hypothesis claiming the presence of less advanced cognitive processes in the development of lexical abilities, in primary school children. The empirical data was gathered from a sample of 472 third grade students, 495 fourth grade students and 521 fifth grade students, with an approximate male-female gender balance; students belong to a middle range of socio-economic and cultural backgrounds, and do not present learning, reading, or writing disabilities or difficulties. The study was conducted in a two-phase experimental design. The first phase saw the gathering of word definitions from a sample of 100 participants, both female and male, for each grade from third to fifth, belonging to the same demographic constituency and sharing the same scholastic qualities as the subjects of the second phase. The second phase involved the completion of 8 tests already verified through item analysis, each with 4 multiple-choice answers evaluating lexical abilities, in which the less advanced processes were among the wrong answers. We verified the presence of said processes, such as tautologies, graphophonemic linking, consecutive effects, image values, and dominant meaning-frequency relationship in the development of lexical abilities of the participants.

Keywords: lexical abilities, development, less advanced cognitive linguistic processes, primary school, reading and writing errors: new findings.

INTRODUCTION

How do we develop lexical abilities? What are the processes characterising their development? In recent studies, particularly since the 1970s, researchers have focused on these questions, providing empirical contributions from their studies.

Specialist literature has mostly been concerned with the acquisition of more advanced and mature acquisitions, highlighting their links with synonymy, antonymy, categorisational (and

prototypical) and functional organisation, both within a phrasal context and in cases that do not fall under the latter.

Based on these studies into more mature processes of lexical ability, the following, briefly summarised results can be observed.

Herrmann (1978) offers an extensive critical review of the research conducted on synonymy. In these investigations, three procedures are usually favoured: indication of two synonyms, production of a given word's synonym, recognition of the synonym from a list of words. Participants are shown to acquire synonyms in two ways: observing the words in their contexts (both experiential and linguistic/narrative) or through instruction, for example they learn that word x has the same meaning as word y.

A further cognitive linguistic form through which vocabulary is developed in its later and advanced stages is found in antonymy. According to Lyons (1977), binary opposition is the structural basis of many languages. Based on the semantic studies conducted by Lyons, Powell (1986) highlights the existence of a large number of antonyms in a person's vocabulary, apparently due to the general tendency of Western cultures to polarise experiences and judgments, leading to an oppositional mode of reasoning. The word 'antonym', coined in 1867, is used to indicate a word that expresses the opposite meaning of another. Powell (1986) lists three main types of word opposition. The first concerns 'contradicting' (complementary) terms, e.g. 'nubile' – 'married'. The second type concerns 'opposite' terms, e.g. 'ascend' – 'descend', words that allow degrees of intensity. The third type sees words that invert or cancel the meaning of others, e.g. 'buy' – 'sell'. As far as the efficacy of antonyms is concerned, in terms of the precision of learning processes, Grossman and Eagle (1970) discovered that antonyms produce a more limited number of false recognitions compared to synonyms and other types of association. Niemi, Vauras and Wright (1980) have observed that antonym production enables a subsequent production of synonyms, while the opposite does not occur. Osgood (1953) used the example of antonymic association to build the semantic differential technique (an evaluation technique allowing the study of connotative meanings of lexicon).

Categorisational (and prototypical) organisation is another cognitive linguistic form through which vocabulary is developed and expanded throughout a person's life. Studies that have chosen to focus on this aspect have suggested the theory of the formal perceptual core as a dominant driver in the evolution of lexical abilities. Said theory originates in Bruner's investigations on the processes of categorisation and sees Eve V. Clark as one of its major advocates (1973, 2009). According to this line of thought, the mind is a system oriented on verbal symbol acquisitions. The basic elements of these verbal symbols are called 'lexical units'. Lexical units are not necessarily words belonging to the child's own language(s). They can be sequences of entirely made-up sounds, e.g. 'wawa' for 'dog', 'tee' for 'cat', 'deda' for 'grandfather', etc. (see Clark, 1973, pp.79-81). In this sense, semantic development consists of a selection process between very heterogeneous objects, in order to delineate, determine their boundaries both within and without the sphere of adult speech where the objects belong. At first children appear to assign to each lexical unit a much wider category than an adult's. Then they appear to apply sub-categories within the macro-category, narrowing them down to the point of identifying the lexical unit's meaning to that of an adult's. In any case, even if in opposite directions, the development consists in the elimination (or addition, in the case of semantic extension) of categories that no longer apply, under formal perception criteria, to a given word. The process ends once the subjects have reached the expected standards of their language, culture, adult speech, to appropriately express a certain lexical unit.

Alongside this formal perceptual core theory, we also find in Bruner's work, the idea of 'functional core', elaborated by Katherine Nelson (1974, 2007). The basic notion underlying conceptual development and semantic memory is that the mind is a system that acts upon the world. In this

dynamic, interactive model, the mind develops, that is to say it builds its own understanding of the world and at the same time structures, articulates, coordinates the processes within it. Thanks to this, the child learns a series of dynamic and functional relations, respectively: locational relations, agency relations, actional relations. Of course, these daily routines present a number of variations. This also implies the existence of fundamental relations building the central functional core (e.g. the apple is eaten – principal action scheme), while others are regarded as peripheral functional relations (e.g. the apple is in the basket on the table, etc.). When, around the age of 12 months, children learn their first words, prelinguistic concepts are once more organised and better shaped through language. The prelinguistic concept for apple, for example, once the child can express and understand the word 'apple', gains additional elements. The various concrete and specific scenarios in which children find themselves as actors or spectators or both, also generate 'event representations', a type of 'script'. It is precisely within these event representations that 'functional products' arise among available information and the 'central functional cores' corresponding to various concepts are established. Therefore, moments of interactive social exchange between children and their carers take on a crucial aspect in event representation and in the development of the conceptual and semantic systems.

Another field of study among these mature modes has been polysemies, words that cover more than one meaning, e.g. 'a football match', 'a lighted match', 'a perfect match', as has the influence of context in solving semantic ambiguities. These studies have been conducted to understand the processes involved in the expansion of a child's vocabulary, calculated as adding 10-13 words per day at the age of 5-6, increasing to 40,000 words by the end of high school, and 80,000 or even 100,000 in individuals of graduate and post graduate education levels (Chall 1987; Nagy, & Herman 1987; Sternberg 1987; Miller, & Gildea 1987; Bloom 2000). Studies on phrasal context for the understanding of one word have been characterised by two lines of thought. The first sees research conducted on the use of context for the comprehension of new or unknown words. The second sees the same use of contextual information, but for the comprehension of known but ambiguous or polysemic words. The ability to define the meaning of a made-up word thanks to the contextual relations it carries has been studied in students between the age of 8 and 13 (Werner, & Kaplan 1950; Petter 1955). These studies have shown that the use of contextualization for comprehension is also present at childhood level, but that phrasal context suggestions to stimulate lexical growth are particularly active at middle school levels. As for the other line of thought, the one which focuses on context to determine alternative meanings of known words, studies have employed modern methods of on-line research (the subject's mental activity and behaviour are recorded on a number of machines as they perform a given task), in order to follow the developments in real time (Swinney 1979; Tabossi, & Johnson-Laird 1980). The results of these studies are in accordance with the experiments conducted by Werner and Kaplan (1950; 1952) and Petter (1955), meaning that children are actively engaging with the context, but often misuse or use it incorrectly.

PROBLEM

It has been observed that lexical abilities are developed from less advanced forms, genetically less evolved, towards modes sometimes defined as 'Aristotelian' due to their proximity to more adult notions of definition. The evolutionary stages of these transformations have been particularly studied in the age range 2-3 to 7-8 and in adults (Al-Issa, 1969; Anglin, 1970, 1977; Ehri, & Richardson, 1972; Litowitz, 1977; Bartlett, 1977; Arcuri, & Girotto, 1986; Kuczaj, & Barrett, 1986; Miller, & Gildea, 1987; Benelli, 1989; Girotti, Antonietti, & Marchetti, 1990; Belacchi, & Benelli, 2007). Less studied are the stages for primary school age groups, from 8 to 11-12 (cf. for example, Bloom, 2000; Wagner, Muse, & Tannenbaum, 2007; Schmitt, 2010).

RESEARCH GOALS

The aim of this study is to present the empirical results of the investigation performed on less advanced forms and processes understudied until now.

Considering the core matter of this study, genetically precedent processes, we have observed that it is possible to document methods connected to word generative mechanisms that previous studies in this field have mostly placed in early childhood phases. These methods are characterised by, for example, circular forms. Litowitz (1977) indicates predicate linking as being characteristic of intermediate forms in the five levels she describes in the development of definition strategies. According to this data, it appears that children shift from the simple gesture response to questions, e.g. when asked what is, what does 'bite' mean, they reply with a bite motion with their mouth, to Aristotelian responses, e.g. what is, what does 'donkey' mean, they respond with 'an animal'. Predicate linkings are placed between the second and third level. At level 2 a child associates one or two words to the stimulus word (e.g. question: 'shoe', answer: 'sock'). At level 2/3, there is a repetition of the stimulus word with a predicate or the construction of an association built on the stimulus (e.g. question: 'rock', answer 'rocking', 'a person rocks on a rocker'). These phenomena are also observed by Arcaini (1982), who terms them tautologies, both with and without expansion, e.g. question: 'tail', answer: 'a cat's tail', 'a tail made of fur' (p. 89). Brandi and Cordin (1986) report the same findings, e.g. to questions such as what does 'sad' mean, we observe answers such as: 'I am sad when something bad happens, like someone dies'; while the word: 'fear', yields the answer: 'fear of the dark'. Another mode is the allocation of meaning based on graphic or phonetic similarities. Arcaini (1982) mentions phonetic attraction, e.g. question: 'read', answer: 'bread'. A third mode consists of the proximity effects of words in a spoken sequence, also called syntagmatic (de Saussure) or contiguous relations (Jakobson). A fourth mode is the so called image value of a word. Asch and Nerlove (1960) have found how children of 4-5 describe certain terms by only referring to physical objects, e.g. 'a sweet person' is such because 'they like sweet things', or 'mum is sweet because she bakes sweet things'. They discovered that only at the age of 7-8 children are able to understand the psychological meaning of words with double functions, such as 'brilliant' in 'brilliant people are nice and happy'. A significant contribution to these studies is found with Paivio (1971, 2006), and his theory of the 'double code'. Finally, a fifth mode is found in use frequency, the dominant meaning of words.

The goal of this study is to demonstrate that alongside the more mature processes explored in scientific research cases, children between third and fifth grade present modes which are genetically or evolutionary precedent employing the same word ('tautology'), similar terms in graphic and phonetic aspects ('graphophonemic linkings'), word proximity ('consecutive effects'), words related to images linked to the ones that need defining ('image value'), or more frequent meanings, even if incorrect, of the words that need defining ('frequency-dominant meaning').

Our hypothesis, then, is that these genetically less developed modes are still present in children from third to fifth grade, not as episodic or rare forms, but in systematic and consistent patterns, even if decreasing with the development of the subjects.

METHOD

Participants

For the first phase of the study, necessary for gathering the children's ideas about the words proposed in order to build the tests, there were 100 participants (of average age, standard deviations and ranges similar to those in the second phase of the study), they were not part of the group of participants in the second phase of the study and there were approximately an equal number of boys

and girls, with similar socio, economic and cultural backgrounds. Whereas participants in the second phase of the experiment included 215 girls and 257 boys in third grade (average age = 8.4, DS = 0.88, range 7 to 8.8), 240 girls and 255 boys in fourth grade (average age = 9.8, DS = 0.90, range 8.8 to 10), 245 girls and 276 boys in fifth grade (average age = 10.8, DS = 0.78, range 9.8 to 11.6) (total 1488), belonging to average socio, economic and cultural backgrounds. The words employed in both phases of the research were of medium frequency and image value for the ages considered (we drew this fundamental information mainly from *Il dizionario della lingua italiana* [Italian language dictionary] by De Mauro, 2000, which gives usage with specific detailed multiple usage entries for each word). Subjects in both phases of the study had an average scholastic performance and did not present any difficulty or disability in reading or writing tasks.

Materials and procedures

The experimental design was divided in two phases. The first one asked 100 primary school-children from each age range (third to fifth grade), male and female, to define a list of words selected from short reading texts from primary school text books. The texts were also chosen following indexes (synthetic and relevant to 8 specific dimensions: comprehensibility and appropriateness of the text as regards emotions and affection, interests, and moral, social, linguistic, aesthetic and scientific education of the students) provided by a sample of primary education teachers according to their value, expressed using a scale of 0 to 10, of the text overall (synthetic index) and of the 8 categories above. The texts used (narrative and descriptive) presented approval ratings above 80%. The texts were also tested against the Flesch readability formula (DuBay, 2004), obtaining scores from 64 to 73; given that the medium level of difficulty for the formula is 50, the texts were deemed suitable for the ages considered in the study. During the first phase, then, we observed the responses given by the children to questions such as 'What does x (word from the text) mean?', or 'What is an x (word from the text)?'. The words were chosen according to medium frequency and image value, and therefore suitable for the subjects (see De Mauro, 2000). The children were asked to provide the best written definition according to them. Furthermore, the scholastic performance of the children showed that none of them manifested reading, writing or learning difficulties and they were given all the time they needed to write the answers, after their own reading of the texts and questions. However, to ensure a full and rigorous verification of the width and consistency of the less developed forms object of our study, as well as the more mature ones, we devised multiple-choice tests with four possible answers, including ones presenting these less developed forms among the incorrect answers. In this second phase of the experimental design, we used the definitions given by the children as the basis tests which we then subjected to item analysis, calculating the index of difficulty, ability to distinguish, reliability factor (using the Kuder-Richardson formula). This allowed us to accurately select a list of items with valid metrology to assess the children's lexical abilities. The final test consisted of 8 tasks: task 1, non contextual synonyms; task 2, contextual synonyms; task 3, non contextual antonyms; task 4, contextual antonyms; task 5, non contextual categories; task 6, contextual categories; task 7 non contextual functions; task 8, contextual functions (*Prove Analitiche di Vocabolario PAV* [PAV or *Analytical Vocabulary Test*, Florence, O.S.] by Boschi, Aprile & Scibetta, 1991).

In order to allow the reader to directly assess the test's tools, which, once again, have been tested according to all the metrological criteria indicated by the literature and listed above ('index of difficulty', 'ability to distinguish', 'reliability factor' calculated via the Kuder-Richardson formula), we provide below examples of items in which the less developed forms are present:

Tautologies (with and without expansion):

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Text: "A thirsty crow"

"a thirsty crow **saw** a jug of water by a river ..."

Q. A word with similar, but not same, meaning to '**saw**' is:

- a. knocked
- b. saw
- c. observed
- d. drew

Tautological response: b. saw.

Graphophonemic linkings (graphic or phonemic similarities):

Text: "A thirsty crow"

"... full of **pleasure** it flew towards the jug..."

Q. "**pleasure**" can mean:

- a. leisure
- b. confidence
- c. craftiness
- d. joy

Graphophonemic linking response: a. leisure.

Consecutive effects (words physically close to the target):

Text: "Napoleon"

"Napoleon Bonaparte, a great **general**, was a short man ..."

Q. "**general**" is used for people who are:

- a. common
- b. fighting
- c. short
- d. travelling

Consecutive effect response: c. short.

Image value (concrete vs abstract):

Text: "The donkey in the river"

"... A short time later, the same donkey **returned** down the same road. ..."

Q. The opposite of "**returned**" is:

- a. sent
- b. kept
- c. stayed
- d. changed

Image value response: b. sent.

Use frequency-Dominant meaning (frequent-dominant usage of the word):

Text: "A shepherd"

"... the goats came to eat the acorns, but without realising they also ate the mantle belonging to the shepherd"

Q. The goats treat **the mantle** as:

- a. clothing
- b. cover
- c. food

d. support

Use frequency-dominant meaning response: b. cover.

RESULTS

The results obtained highlight that genetically less developed processes are still present next to the evolutionary trend for more mature lexical abilities, as we hypothesised for children in third to fifth grade. These are shown in Table 1.

Table 1 – Median of percentile responses to critical distractors: tautologies, graphophonemic linkings, consecutive effects, image values, use frequency-dominant meaning for third, fourth and fifth grade students.

Critical distractor	N	% Response (median values)		
		III	IV	V
Tautologies	7	12.71	7.71	6.57
Graphophonemic linkings	16	21.31	15.31	9.25
Consecutive effects	9	17.33	11.22	8.67
Image value	14	29.29	21.00	15.21
Use frequency-dominant meaning	13	28.77	23.62	17.69
Total (median values)	59	21.88	15.77	11.47

As we can see, values tend to decrease from third to fifth grade. They are, however, still present, in third, fourth and fifth grade, with consistent values.

For this reason, we decided to test to what extent the 'wrong' answers ('reading and writing errors') featuring tautologies, graphophonemic linkings, consecutive effects, image values, use frequency-dominant meanings were significant and occurring cognitive linguistic modes for those age groups. We then compared them to the distractors provided by generic wrong answers we built in the tests. The results are shown in Table 2.

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Table 2 – *t* of Student resulting from comparing “critical” and “generic” distractors
(*N* = 1488; d.f. = degrees of freedom of Student *t*).

Grade	N		“critical” distr		“generic” distr		d.f.	t	P
			median	S.D.	median	S.D.			
III	472	Tautologies	.66	1.05	.83	.79	(470)	-2.74	.01
IV	495		.41	.83	.62	.71	(493)	-4.27	.00
V	521		.34	.79	.50	.64	(519)	-3.71	.00
III	472	Graphophonemic	3.19	2.01	2.43	1.19	(470)	6.67	.00
IV	495	linkings	2.27	1.93	1.81	1.35	(493)	4.63	.00
V	521		1.37	1.52	1.54	1.34	(519)	-2.23	.03
III	472	Consecutive effects	1.30	1.24	1.01	.93	(470)	3.88	.00
IV	495		.87	1.04	.81	.91	(493)	1.07	ns
V	521		.67	.88	.55	.75	(519)	2.46	.02
III	472	Image value	3.10	1.67	1.19	1.14	(470)	19.17	.00
IV	495		2.36	1.57	1.00	.99	(493)	15.53	.00
V	521		1.61	1.45	.90	.94	(519)	9.50	.00
III	472	Use frequency-	1.63	1.14	1.06	1.02	(470)	7.77	.00
IV	495	dominant meaning	1.37	1.09	.78	.91	(493)	8.84	.00
V	521		1.11	1.09	.61	.82	(519)	9.12	.00

DISCUSSION AND CONCLUSIONS

In almost all cases considered, in which the comparison was made, as can be seen in the results summarised in Table 2, the calculated *t* values of Student are significant results, with the exception of 'consecutive effects' for fourth grade ($t(493) = 1.07$ non-significant result, ns.), proving that the less genetically advanced cognitive linguistic forms we defined are consistent processes compared to generic errors.

Due to the lack of empirical data, even experimental, to the same effect, we were unable to confront our study to others on similar phenomena, as also reported in recent scientific publications (cf. for example Bloom, 2000; Wagner, Muse, and Tannenbaum, 2007; Schmitt, 2010).

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